OCAS-PER-031, Subtasks 1–3 EVALUATION OF THE NATIONAL SECURITY COMPLEX (Y-12) TBD REVISIONS

SC&A Report Dated July 15, 2013

Presented to the
Advisory Board's Procedures Review Subcommittee
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OCAS-PER-031 Summary

- The Y-12 TBD (six volumes numbered ORAUT-TKBS-0014-1 through ORAUT-TKBS-0014-6) was revised numerous times between 2003 and 2012.

- OCAS-PER-031 (2007) was issued due to the TBD change in the Th-228/Th-230 ratio from 1:1 to 0.8:1.

NIOSH's Issue

- NIOSH stated that this change would result in an increase in assigned dose.

NIOSH's Number of Claims

- NIOSH identified 693 Y-12 claims that were completed prior to the date of issuance of PER-031 (December 18, 2007) and had a probability of causation (POC) below 50%.

NIOSH's Corrective Action

- NIOSH will review the DR for each of these 693 claims to determine if the evaluation of dose involved exposure to, and intake from, purified thorium.

SC&A's Subtasks 1 & 2

- SC&A performed a paragraph-by-paragraph comparison of the first three revisions (up to and including Rev. 1 PC-2 dated January 12, 2006, that was used in OCAS-PER-031) of ORAUT-TKBS-0014-5 (referred to as TBD-5) to identify changes that could potentially impact the assigned dose.

SC&A's Subtasks 1 & 2 (continued)

- SC&A's comparison of the different Y-12 TBD-5 versions did not identify any changes that would impact the assigned doses, except for the method of determining purified thorium (Th-232 and Th-228) body burdens.

SC&A Finding #1

- **Finding #1: Change in Assigned Dose –** The change in the Th-228/Th-232 ratio would actually reduce the assigned dose, not increase it, if thorium intakes and resulting doses are based on recorded mg values of thorium from chest counts, as was observed in the case files SC&A has reviewed to date.

SC&A Finding #2

- **Finding #2: Chest Counts Conversion to Th-232 Body Burden –** The method NIOSH uses (in both the old and new TBD-5) to assign Th-232 body burden assumes that the gamma counts obtained during the chest counts are directly related to Th-232 (in mg) in the lungs, using an empirically derived calibration factor that applies to all Y-12 workers at all times.

Finding #2 (continued)

- This assumption is incorrect because the gammas from Ac-228 and Pb-212 are being counted, and (1) Ac-228 is not in equilibrium with Th-232, (2) Pb-212 is not in equilibrium with Th-228, and (3) Th-228 is not in equilibrium with Th-232. Additionally, a given equilibrium cannot be assumed because it is constantly changing for many years after the purification of thorium.

Finding #3

- **Finding #3: Different Solubility of Thorium and Decay Products in the Lung –** The lung may retain thorium, being relatively insoluble, longer than the more soluble decay products in some cases. Therefore, a lung count based on the decay product (i.e., Ac-228 and/or Pb-212) would not necessarily have a consistent relationship to the thorium (Th-232 and/or Th-228) body burden.

Finding #3 (continued)

- Additionally, the solubility of the decay products themselves (inhaled or formed in the lungs) may have different solubility and not have consistent ratios.

Finding #4

- **Finding #4: MDA or LOD Value –** NIOSH assumed an Ra-228 to Th-232 ratio of 0.6 (page 31 of ORAUT-TKBS-0014-5, 2006) for determining the minimum detectable activity (MDA) of 0.6 nCi; this would require approximately 8 years from purification to counting. This is not a valid assumption for almost all workers and is not constant between each chest count.

Finding #4 (continued)

- The limit of detectability (LOD) value was not directly based on counting statistics, but it was empirically derived and meant to be used only as a screening tool, not to accurately assign dose (West 1965, Scott 1961).

SC&A's Subtask 3 (Number of claims)

- At the time that OCAS-PER-031 was issued (12/18/2007), NIOSH identified 693 Y-12 claims that were completed prior to that date and had a POC below 50%. This establishes an upper-bound estimate of the number of claims that may be impacted. NIOSH intends to screen these claims.

SC&A's Subtask 3 (# of claims) (continued)

- The application of these screening criteria will undoubtedly exclude many of the 693 potential claims from impacts associated with OCAS-PER-031 and the need for the reconstruction of the organ dose. However, until NIOSH reviews all of these claims, the actual number of cases that will be affected by OCAS-PER-031 and require a new dose assessment remains unknown.

SC&A's Subtask 3 (# of claims) (continued)

- In addition, based on the outcome of the findings identified as a result of our technical review of ORAUT-TKBS-0014-5, there may be a need to cancel OCAS-PER-031 and reissue a PER after appropriate changes have been made to the Occupational Internal Dose TBD.

SC&A's Subtask 4
Selection of DRs to audit

- SC&A identified four findings that question the technical merit of the Y-12 Occupational Internal Dose TBD and corrective actions taken by NIOSH in OCAS-PER-031.
- SC&A recommends that the selection of Subtask 4 cases be delayed until the Subcommittee on Procedures Review can further investigate SC&A's findings and concerns.

Questions?